

Translation

PATENT COOPERATION TREATY

PCT/JP2003/015888



PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PCT094JST	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/JP2003/015888	International filing date (day/month/year) 11 December 2003 (11.12.2003)	Priority date (day/month/year) 13 December 2002 (13.12.2002)
International Patent Classification (IPC) or national classification and IPC H01L 29/82, 43/08, 27/105, G11B 5/39, H01F 10/16, 10/32		
Applicant JAPAN SCIENCE AND TECHNOLOGY AGENCY		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☐ (sent to the applicant and to the International Bureau) a total of _____ sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒ Box No. I Basis of the report

☐ Box No. II Priority

☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

☒ Box No. IV Lack of unity of invention

☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

☐ Box No. VI Certain documents cited

☐ Box No. VII Certain defects in the international application

☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 23 June 2004 (23.06.2004)	Date of completion of this report 01 March 2005 (01.03.2005)
Name and mailing address of the IPEA/JP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- ☐ This report is based on translations from the original language into the following language _____, which is language of a translation furnished for the purpose of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☒ The international application as originally filed/furnished

☐ the description: _____, as originally filed/furnished

pages _____

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ the claims: _____, as originally filed/furnished

pages _____

pages* _____, as amended (together with any statement) under Article 19

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ the drawings: _____, as originally filed/furnished

pages _____

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. IV Lack of unity of invention

1. ☐ In response to the invitation to restrict or pay additional fees the applicant has:
- ☐ restricted the claims.
 - ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☐ neither restricted nor paid additional fees.
2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:

SEE SUPPLEMENTAL SHEET

4. Consequently, this report has been established in respect of the following parts of the international application:

☒ all parts.

☐ the parts relating to claims Nos. _____

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Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: IV. 3.

Claims 1 to 14 pertain to a spin injection element wherein a SyAF structure is used in a region into which spin is injected.

Claims 15 to 20 pertain to a spin injection element wherein a non-magnetic layer that reflects spin is provided in a region into which spin is injected.

Claims 21 to 50 pertain to a $\text{Co}_2\text{Fe}_x\text{Cr}_{1-x}\text{Al}$ magnetic thin film.

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V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	21-50	YES
	Claims	1-20	NO
Inventive step (IS)	Claims	21-50	YES
	Claims	1-20	NO
Industrial applicability (IA)	Claims	1-50	YES
	Claims		NO

2. Citations and explanations

Document 1: JP 2001-156357 A (Toshiba Corp.), 8 June 2001, entire text, fig. 1-34,
& EP 1085586 A2

Document 2: JP 2002-092824 A (Hitachi, Ltd., President of Nagoya University), 29 March 2002, column 3, lines 3-14

Document 3: JP 2002-359412 A (Sony Corp.), 13 December 2002, entire text, fig. 1-13,
& US 2003/0011944 A1

Document 4: JP 2002-074622 A (Toshiba Corp.), 15 March 2002, column 13, lines 35-39,
& US 2002/0039264 A1

Claims 1 to 14

The inventions described in claims 1 to 14 lack novelty and do not involve an inventive step.

Document 1 (paragraphs [0050] to [0062]) cited in the international search report discloses an MRAM having a spin-polarizing part for supplying a spin-polarizing current and a free layer comprising a ferromagnetic/non-magnetic/ferromagnetic three-layer structure.

Claims 15 to 20

The inventions described in claims 15 to 20 lack novelty and do not involve an inventive step.

Document 1 (paragraphs [0061] and [0062], fig. 11) cited in the international search report discloses an MRAM having a spin-polarizing part for supplying a spin-polarizing current and a free layer comprising a ferromagnetic layer, wherein Ru is present in the surface of the free layer. Thus, the item indicated by reference number 113 in fig. 11 corresponds to a ferromagnetic fixed layer, the item indicated by reference number 114 corresponds to an injection junction section on a non-magnetic layer, the item indicated by reference number 115a corresponds to a ferromagnetic free layer, and the item indicated by reference number 115b corresponds to a non-magnetic layer provided on the surface of the free layer. Further, an MR element having a Ru film, wherein the Ru film exhibits a mirrored surface reflecting effect, is disclosed in document 4 (paragraph [0076]), and thus, the Ru film on the MR element disclosed in document 1 is also recognized as exhibiting a mirrored surface reflecting effect.

Claims 21 to 50

The inventions described in claims 21 to 50 are novel and involve an inventive step.

Document 2 cited in the international search report discloses the use of a half-metal as a ferromagnetic layer, and document 3 cited in the international search report discloses the use of a CoFeAl alloy as a high-resistance material, but the use of a $\text{Co}_2\text{Fe}_x\text{Cr}_{1-x}\text{Al}$ alloy as a magnetic thin film is not disclosed in any of the documents cited in the international search report, nor would it be obvious to a person skilled in the art.